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# *Sertularella maureenae*, a new species of hydroid (Cnidaria: Hydrozoa: Sertulariidae) from the Pacific coast of Canada

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## Abstract

*Sertularella maureenae*, n. sp. (Hydrozoa: Sertulariidae), is described from the Pacific coast of Canada. The species is characterized by its predominantly stolonal colony form with pedicellate, annulated hydrothecae, together with the presence of large, ovate gonothecae having distinct annulations, a prominent neck, and 4–6 well-developed cusps surrounding the gonothecal aperture. The new species is compared to other stolonal species of the genus and to other typically erect species of Sertulariidae with reported stolonal forms. The presence of both stolonal and semi–erect colony forms with pedicellate hydrothecae within *S. maureenae*, along with its hydrothecal characters, suggests that colony form alone may be an insufficient criterion for assigning species of pedicellate *Sertularella* with individual hydrothecae rising from their hydrorhizae to a separate genus *Calamphora*.

**Key words:** Leptothecata, *Calamphora*, stolonal hydroid colony, epizoic, pedicellate

## Introduction

Sertulariid hydroids of the genus *Sertularella* Gray, 1848 typically exhibit an erect colony form, but stolonal and pedicellate forms exist. Stolonal forms within Sertulariidae include *Calamphora parvula* Allman, 1888, *Sertularella solitaria* Nutting, 1904, *Sertularella campanulata* Warren, 1908, *Sertularella peculiaris* (Leloup, 1935), *Calamphora quadrispinosa* Watson, 2003, and *Sertularella fraseri* Galea, 2010. The stolonal forms carry terminal pedicellate hydrothecae with fully–developed hydranths on a creeping or loosely reticulated hydrorhiza. In both erect and stolonal forms, the hydrotheca possesses a pyramidal operculum composed of four triangular valves, and four marginal cusps. Sub-marginal, intrathecal projections may be present or absent. Bouillon *et al.* (2006) and Millard (1975), however, regard colony form to be of generic value, and assign stolonal forms to a separate genus, *Calamphora* Allman, 1888, based primarily on the presence of a pedicel. Vervoort (1968) considered such a separation to be unnecessary, as Alder (1856) had noted the occurrence of single, stolonal hydrothecae rising from their hydrorhiza amongst the otherwise commonly erect colonies of *Sertularella tenella*. Additionally, the colony structure of epizoic hydroids can be varied and flexible enough to significantly alter the morphology of some species (Orlov, 1997).

A recent examination of hydroids from the Pacific Coast of Canada, originally in collections of the Pacific Biological Station, Nanaimo, British Columbia, Canada, revealed stolonal colonies of a leptothecate hydroid referable to the genus *Sertularella* in several samples. Presently, this hydroid is known only from the localities described in this paper. Colony form and hydrothecal attributes, along with distinctive annulated gonothecae, indicate that this hydroid represents a new species. *Sertularella maureenae*, n. sp., presents both pedicellate and semi-erect hydrothecae on the same stolonal system. Since the former was the predominant form in our samples, we consider *S. maureenae* to be a *preferentially stolonal pedicellate* form. An account of this hitherto undescribed species is given here. We discuss its systematic position in relation to other similarly pedicellate species.

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## Materials and methods

The specimens described are originally from collections of the Pacific Biological Station, Nanaimo, British Columbia, Canada, now deposited in collections of the Invertebrate Zoology Section of the Department of Natural History, Royal Ontario Museum (Toronto, Canada) by Anita Brinckmann-Voss. Materials were collected by dredge in 1934 and 1935 by various collectors, and again from 1959 to 1961 by D.B. Quayle. The collections are listed in the preliminary report by Brinckmann-Voss (1983). Specimens were fixed in formalin and preserved in 75% ethanol. To examine the structure of the perisarc, some specimens were cleared with 5% solution of sodium hypochlorite for 30 seconds, and rinsed in distilled water. Type material has been deposited at the Royal Ontario Museum, Invertebrate Zoology Section, Department of Natural History (ROM), and the Royal British Columbia Museum (RBCM), Victoria, British Columbia.

## Systematic account

### Order Leptothecata Cornelius, 1992
### Family Sertulariidae Lamouroux, 1812
### Genus *Sertularella* Gray, 1848

### Species *Sertularella maureenae*, n. sp. (Fig.1)

**Material**

Holotype: CANADA, British Columbia, Nootka District, Bajo Point Locality, 49˚36’45”N, 126˚49’W, collected 26.VI.1934. Stolonal colony on calcareous algae (*Bossiella* sp.), with gonothecae (ROMIZ B3868).

Paratypes: CANADA, British Columbia, Nootka District, Bajo Point Locality, 49˚36’45”N, 126˚49’W, collected 26.VI.1934: Stolonal colony on calcareous algae (*Bossiella* sp.), with gonothecae (ROMIZ B3869); stolonal colony on calcareous algae (*Bossiella* sp.), with gonothecae (ROMIZ B3870); stolonal colony on calcareous algae (*Bossiella* sp.), with gonothecae (ROMIZ B3871); single polyp on pedicel, gonotheca attached (ROMIZ B3872). CANADA, British Columbia**,** Queen Charlotte Land District, Swan Hill Locality, 54˚07’N, 131˚36’W, collected 21.IV.1961 by DB Quayle, 16.46 metres: stolonal colony, growing on calcareous algae (*Bossiella* sp.), no gonothecae (ROMIZ B3876); 54˚07’N, 131˚36’W, collected 21.IV.1961 by DB Quayle, 16.46 metres: stolonal colony, growing on calcareous algae (*Bossiella* sp.), no gonothecae (RBCM 011-00161-001).

**Known distribution**

Pacific coast of Canada, 49˚36’45”N, 126˚49’W; 54˚07’N, 131˚36’W.

**Description**

Colonies predominantly stolonal, but sometimes with occasional short, erect, unbranched hydrocauli; hydrorhiza smooth, creeping or loosely reticulated. Hydrothecae when stolonal supported on wrinkled pedicels of varied length having at least two spiral twists; hydrothecal pedicels increasing in diameter distally, each bearing a terminal hydrotheca on a pedestal-like base. Pedicels 110–550 μm long. Hydrocauli, when present, rudimentary, comprising a vertical series of as many as six hydrothecae supported by a successive series of wrinkled hydrothecal pedicels that resemble internodes, each except the proximal-most of these arising from base of the hydrotheca immediately below. Hydrothecae fusiform, 374–595 μm in length; 176–396 μm maximum diameter, appearing somewhat radially symmetrical but exhibiting bilateral symmetry due to slight bulge of hydrothecal wall on distal end proximal to hydrothecal aperture, causing neck to bend forward slightly; bilateral symmetry also apparent internally due to excentric hydropore; hydrothecal walls usually with three to five transverse, complete annulations that vary from well-defined to faint, annulations rounded, never having appearance of sharp ribs or strong crease lines; hydrotheca narrowing distally to a short, smooth neck 66–198 μm in length. Hydrothecal rim with four well-defined, sharp to slightly rounded, equal-sized cusps; operculum of four equal, triangular valves, with valves converging centrally to form a pyramidal structure, peak elevated above hydrothecal margin. Hydrothecal cavity with three intrathecal projections just below rim; intrathecal projections unequally developed, with one large and triangular and two smaller, flattened, longer than wide. Intrathecal projections neither abcauline nor adcauline due to

pedicellate nature of hydrotheca. Large triangular intrathecal projection may coincide with forward bend in neck. Extra intrathecal projections never present. Perisarc of varied thickness, thickest at diaphragm separating base of hydrotheca from pedicel; diaphragm with an excentric hydropore. Hydranths contracted and poorly preserved, attachment of ectoderm to hydrothecal wall on one side visible, suggesting a blind caecum; tentacle type, numbers, and structure not discernable in deteriorated material.

Gonophores believed to be fixed sporosacs. Gonothecae solitary, ovate, much broader and larger than hydrothecae; 770–1,012 μm in length and 484–-660 μm maximum diameter, arising via short stalks 66–88 μm long either from hydrothecal pedicels immediately below hydrothecae or directly from hydrorhiza; gonothecal walls with five to six distinct annulations spanning entire length; perisarc essentially uniform in thickness throughout; distal end of gonotheca elongated into a distinct neck 88–176 μm in length; terminal aperture surrounded by four to six well-developed, pointed, equal-sized cusps; aperture with no valves observed.

**Reproductive period**

Gonothecae observed in specimens collected during June. No gonothecae found in specimens collected during April. The available material was only collected in April and June, so the full extent of the reproductive period, while including June, remains unknown.

**Differential Diagnosis**

Comparisons with other species of *Sertularella* are based on data from Coughtrey (1875, 1876), Leloup (1935, 1937, 1974), Mammen (1965), Naumov (1969), Vervoort (1972), Millard (1975), Cornelius (1979), Schuchert (2001), Calder *et al*. (2003), and Galea (2008, 2010). Comparisons with hydroids of the genus *Calamphora* are based on Millard (1975), and Watson (2003). Specimens of *S. ampullacea* (ROMIZ B3534), erect colonies of *S. tenella* (ROMIZ B3937), and a pedicellate specimen of *S. tenella* (ROMIZ B3936) were examined as part of this study.

Morphologically, colonies of *Sertularella maureenae*, n. sp. somewhat resemble those of the following species: *Sertularella ellisii* (Deshayes & Milne Edwards, 1836), *S. tenella* (Alder, 1856), *S. robusta* Coughtrey, 1876, *S. peculiaris* (Leloup, 1935), *S. fraseri* Galea, 2010, *Calamphora parvula* Allman, 1888, *C. campanulata* (Warren 1908), and *C. quadrispinosa* Watson, 2003. However, despite superficial resemblances, *S. maureenae* is clearly distinguished from its congeners and species assigned to the genus *Calamphora* by its collective hydrothecal and gonothecal characters, and its preferentially stolonal, creeping, pedicellate colony form. In our discussion, we include all known *Calamphora* species because of their pedicellate structure, but except for *Sertularella ellisii*, only compare *Sertularella* species with documented stolonal colonies.

*Sertularella maureenae* differs from *S. ellisii*, *S. tenella*, and *S. robusta* by the presence of an intrathecal septum, which forms an almost complete diaphragm in *S. maureenae*. *Sertularella ampullacea*, *S. peculiaris*, *S. fraseri*, and *Calamphora parvula* can be distinguished from *S. maureenae* by possessing more than three intrathecal cusps; four in *S. ampullacea* and five in *S. peculiaris* and *C. parvula*. *Calamphora quadrispinosa* is unlike *S. maureenae* in that it is has predominantly barrel-shaped hydrothecae that are entirely smooth or weakly undulated, and flanged opercular valves when immature. Unlike the hydrothecal operculum, which becomes torn into apical tufts in mature *C. quadrispinosa*, the four opercular valves of *S. maureenae* retain a distinct pyramidal structure into maturity. No flanging of opercular valves or apical tufts was observed in hydrothecae of *S. maureenae.*

In having a prominent neck and large, well-developed gonothecal cusps, *Sertularella maureenae* differs also from *S. ellisii*, *S. ampullacea*, *S. peculiaris*, *C. parvula*, and *C. campanulata*. In *S. peculiaris*, the gonotheca has a short neck and the gonothecal aperture is surrounded by three to four small, rounded apical projections. *Sertularella fraseri* also bears gonothecae with four, small rounded projections on the aperture. *Sertularella maureenae* differs from *S. robusta* by the more variable development of gonothecal features in the latter. In *S. robusta* the gonothecal cusps may be much reduced to dome-like prominences, but in *S. maureenae* gonothecal cusps are always well-developed, large, and pointed. Gonothecae of *S. maureenae* are proportionally smaller in comparison to associated hydrothecae than are those of *S. robusta*. Gonothecae of *Calamphora quadrispinosa* have four long, incurved cusps and deep flanges instead of the distinct, rounded annulations found in those of *S. maureenae*.

Table 1 summarizes characters distinguishing morphologically similar species reviewed above.

*Sertularella maureenae* can be distinguished from other species in both nominal genera by the following characteristics: (1) three intrathecal projections always present, (2) perisarc is uniformly thickened, (3) the intrathecal

septum forms an almost complete diaphragm, and (4) gonothecae are ovate and well-annulated, with a distinct neck and 4–6 well-developed cusps. At present, *S. maureenae* is known only from two localities off British Columbia on the Pacific coast of Canada.

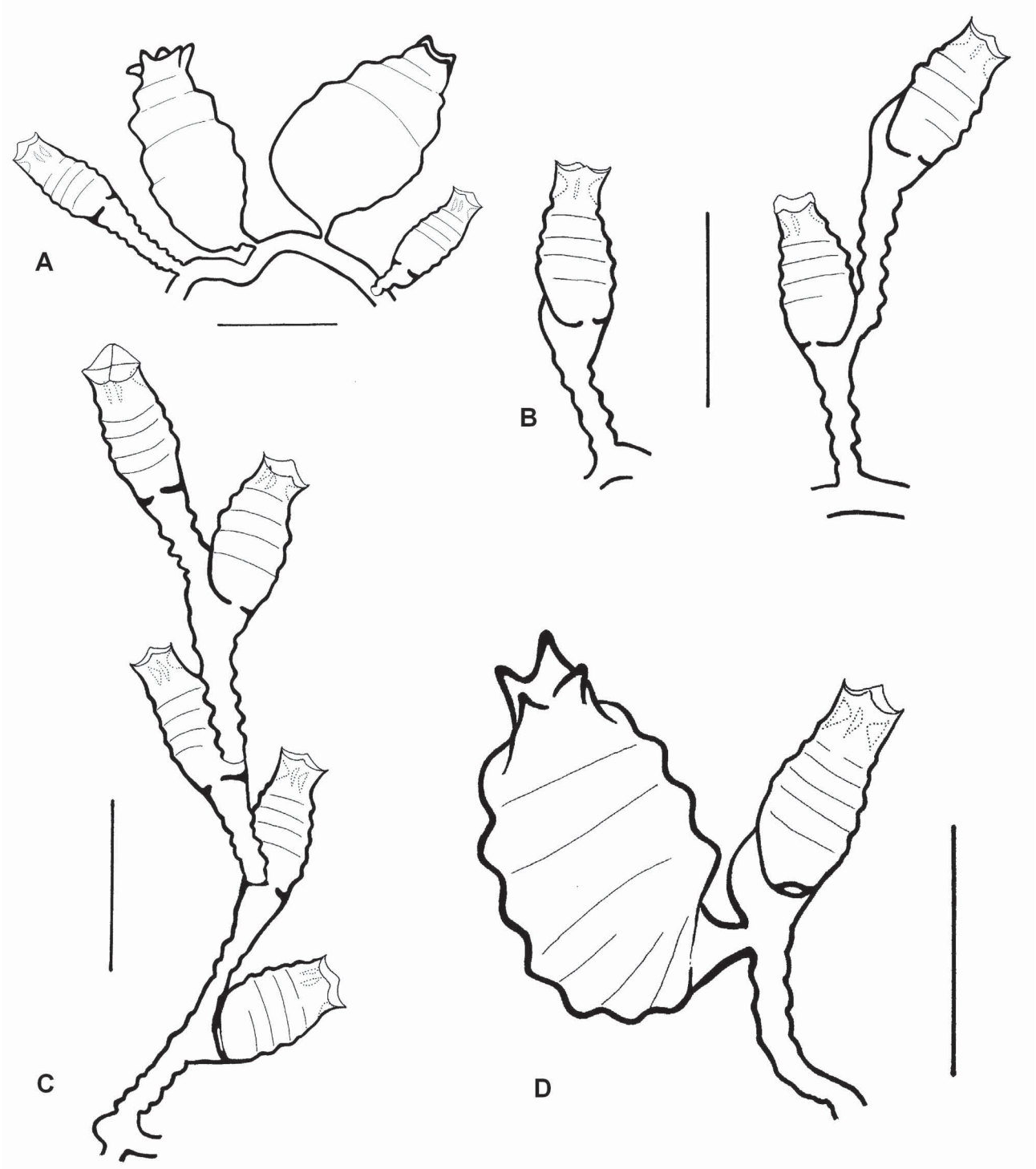


**FIGURE 1.** Sertularella maureenae, n. sp. A-C, holotype, ROMIZ B3868: A, hydrothecae and gonothecae arising from stolon; B, hydrothecae on wrinkled pedicels; C, semi-erect arrangement. D, paratype, ROMIZ B3872: gonotheca attachment immediately below hydrotheca. Scale bars equal 0.5 mm.

Occasionally in *Sertularella maureenae*, two or more hydrothecae form semi-erect arrangements arising from the same stolon bearing single pedicellate ones. Unlike in other typically erect species of *Sertularella* where stolonal, pedicellate forms are an exceptional growth form, hydrothecae of *S. maureenae* are primarily stolonal and pedicellate. Preferentially pedicellate colony form distinguishes *S. maureenae* from *S. robusta, S. fraseri*, and

**TABLE 1.** Characters used to distinguish *Sertularella maureenae* from similar congeners and *Calamphora* spp.

| Character | *Sertularella maureenae* | *Sertularella robusta* | *Sertularella tenella* | *Sertularella peculiaris* | *Sertularella fraseri* | *Sertularella ellisii* | *Sertularella ampullacea* | *Calamphora parvula* | *Calamphora campanulata* | *Calamphora solitaria* | *Calamphora quadrispinosa* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| stolonal colonies | yes | yes | yes, incipient erect stems | yes | yes, rare, incipient erect stems | no | yes, cormoid | yes | yes | yes | yes |
| terminal hydrotheca on pedicel | yes | occasionally | occasionally | yes | rare | no | yes | yes | yes | yes | yes |
| hydrotheca undulated | yes | yes | yes, slight and abcauline, or no | yes | yes | yes, indistinct or smooth | yes | yes | yes | yes | yes, indistinct or smooth |
| undulations completely encircle hydrotheca (annulations) | yes, rounded, sometimes faint | yes, faint or well–developed ridges | yes, sharp rings | yes, irregular ribs | yes, sharp rings | yes | yes | yes | yes | yes | no |
| smooth portion of hydrotheca | distal, prominent neck, always | distal, prominent neck, always | distal, short or prominent neck, always | proximal, variable | distal. prominent neck, always | yes, distal or entire | distal, short neck, always | distal, short neck, always | proximal, sometimes | no | entire hydrotheca variably smooth |
| intrathecal septum | yes, almost complete diaphragm | no | no | yes, thick diaphragm | no | no | yes, perisarc thickening, one side more prominent | yes | yes, perisarc thickening | yes | yes, diaphragm thick |
| intrathecal cusps | yes, 3 | yes, 3 | no | yes, 5 | yes, 5 | yes, 3, occasionally 4 | yes, 4 | yes, 5 | no | not known | no |
| hydrotheca alternating in erect forms | no | yes | yes | yes, somewhat | yes | yes | no | no | no | no | no |
| gonothecal cusps | 4–6, well-developed, prominent | 3–4, variable development, may be much reduced | 4, occasionally 6, small | 3–4, small, rounded projections | 4, small, rounded projections | 3, occasionally 4, small | 4, small | 4, small | 4 | not known | 4, long, incurved |
| gonotheca neck | yes, distinct | yes, | no or short | short | no or short | yes, short | yes, short | no | no | not known | no |
| gonothecal annulations | 5–6, distinct, rounded, entire | 3–4, variable development, entire | 10–13, distinct, sharp, distal half or entire | 7–8, external folds | 9–11, transverse ribs, entire | slightly undulated, entire | ≥7, distinct | yes | yes | not known | 6–9, distinct, deep flanges, entire |

S. *ellisii*. The growth pattern is somewhat similar to that of *S. tenella*, where new hydrothecae arise by the extension of the growing point of an internode behind other hydrotheca. In *S. maureenae*, unlike in *S. tenella*, the non-pedicellate colony form does not follow a strictly alternating (paired) arrangement and no more than five or six (usually less than five) hydrothecae have been observed in this arrangement in the holotype or in other type material. The internodes, pedicellate in form, are also shorter than in *S. tenella.*

## Discussion

In having (1) bilaterally symmetrical hydrothecae of the typical sertulariid type, (2) four equally–developed marginal cusps, and (3) pyramid-shaped opercula with four triangular valves, the new species described herein is assigned to the genus *Sertularella* Gray, 1848. However, the identification and classification of pedicellate species of Sertulariidae have been somewhat problematic. The colony form of pedicellate species of *Sertularella* and specimens without associated gonothecae could be mistaken for immature individuals, if not for their fully formed hydranth and operculum (Nutting 1904). Although their family relationships are clear, stalked species of Sertulariidae have been included at various times in Campanulinidae and Campanulariidae, as well as in Sertulariidae (Millard, 1975). Due to their appearance of outer radial symmetry and pedicellate structure, Nutting (1904) considered *Sertularella solitaria* to be intermediate between campanularian and sertularian types. Within Sertulariidae, Watson (2003) and Bouillon *et al*. (2006) distinguished between *Sertularella* and *Calamphora* mainly by colony form (erect in *Sertularella* and stolonal in *Calamphora*), and by hydrothecal attachment (pedicellate hydrothecae in *Calamphora* and sessile in *Sertularella*).

Occasionally, however, stolonal colonies are observed to bear a few erect, sparingly branched stems. *Calamphora quadrispinosa* exhibits sparingly branched stems in addition to its pedicellate structure (Watson 2003), as does *Sertularella peculiaris* (Galea, 2008). Conversely, normally erect colonies of *Sertularella tenella* have been observed by Alder (1856) to occasionally produce pedicellate specimens. Vervoort (1967) argued on this basis that all species of *Sertularella* with separate hydrothecae rising from their hydrorhiza be retained in that genus. We have also found "solitary" or pedicellate parts of colonies of *S. tenella* in our collections. These often occur near the ends of hydrorhizal tubes, and represent an early stage in the development of erect stems.

In our samples, colonies of *Sertularella maureenae* collected off the Pacific coast of Canada, southwest of Nootka Island, and northeast of Graham Island, British Columbia at depths of around 16 metres were established as epizoans on calcareous algae (*Bossiella* sp.). Some colonies were observed to have developed on gonothecae of *Symplectoscyphus turgidus* present on the same substrate. Orlov (1997) observed that epizoic hydroids can transform their colonial structure to place their hydranths in a suitable feeding environment and suggests that plasticity in colony form strongly influences successful development of epibenthic communities in which there is interspecific competition for space. In the White Sea, *Symplectoscyphus tricuspidatus* developed creeping hydrocauli when epizoic on other species of Sertulariidae (Orlov 1997). *Sertularella maureenae* was observed only as creepers on *Bossiella* sp. and on other hydroids of Sertulariidae (*Abietinaria* sp. and *Symplectoscyphus turgidus*). In both instances, colonies of *S. maureenae* represented second-or-third-level epizoans on the host colony. On *Abietinaria* sp., *S. maureenae* was observed to have longer pedicels with as least five twists. On the same substrates, *S. maureenae* was absent from surfaces already colonized by other creeping hydroids such as *Orthopyxis everta*. Therefore, the presence of both stolonal pedicellate and semi-erect colony forms within *S. maureenae*, suggests that in this species, colony form is preferential mode of growth rather than a characteristic indicating systematic relationships. Accordingly, we retain our new species in *Sertularella*.

**Etymology.** The specific name *maureenae* honours Ms Maureen Zubowski, Technician, Invertebrate Zoology Section of the Department of Natural History, Royal Ontario Museum, in recognition of her continuing invaluable service to the Department and for her kind assistance to the authors of this paper.

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